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Dynamic Properties of Particles

George P. Shpenkov

g.shpenkov@gmail.com

http://shpenkov.com/pdf/talkBrussels2017.pdf

Fatal flaw of the Standard Model (SM)

is an erroneous paradigm
underlying it, namely:

1) ***Formal logic*** *and*
2) ***Abstract-mathematical (fictional) postulates.***

For this reason,

describing observed phenomena, answering somehow the question "How", modern theories of physics do not answer, as a rule, the question "Why?"

Relying on fictional postulates, and, therefore, on theories, which for this reason are inadequate to reality, cognition of Nature is impossible in principle!

This is why modern physics

<u>can not cope</u> with the main key problems, such as:

what is the charge,
what is the origin of mass,
what is the nature of gravity, what is
the nature of origin and the structure of all atomic isotopes,
what is the physical meaning of the speed "c" in Eq. $E_0 = m_0 c^2$
what is the nature of the fine structure constant, "α", …;

<u>is unable</u>

to derive

neutron magnetic moment,
proton magnetic moment, …;

to build

a unified field theory, …;

<u>erroneously interprets:</u>

polar-azimuthal functions in the Schrödinger equation,
the nature of cosmic microwave background radiation,
a phenomenon called the Lamb shift, …;

Etc.

All of the above problems succeeded to solve after replacing the existing conceptual basis of physics for a new one, adequate to reality, which we adhere to in our studies [1-3]**.** !

Part 1

New basic concepts of physics

The new conceptual basis of physics,

*which **enabled** us to solve **all the problems mentioned above**,*
was implemented

*in the **new general theory** that we develop, called the*

Wave Model

To date,

The WM involves two theories:

1) Dynamic Model (DM) of elementary particles *and*

(*under consideration here*)

2) Shell-Nodal atomic model

(*see, e. g.*, http://shpenkov.com/pdf/talk2016Paris.pdf)

The new paradigm

of physics

that forms the basis of the Wave Model,

includes:

* ***Dialectical philosophy and logic (dialectics),***

and

* ***The only axiom about the wave nature of all phenomena and objects in the Universe.***

According to ***Dialectics,***

The Universe is a material-ideal system

which is in ***permanent*** *oscillatory-wave* ***motion****, where there are no rest, no absolute vacuum, no emptiness, no static fields.*

Along with matter, *there is*
its polar opposite – not a material component:

something impalpable, reasonable, mysterious*, that*

*— **is responsible for** the creation of matter and life;*

*— **defines** our intelligence, thoughts, the order, regularities, incessant oscillatory-wave motion and harmony in the Universe, ...;*

*— **includes** an information field containing knowledge about everything, as e.g. numerical fields, laws of nature,..., and about everyone in the Universe, ...;*

*— **etc.***

WM recognizes the existence

of such a

Comprehensive Physical Field-Space,

unlike all other cosmic fields, which is the ***primary source*** *from which*

all particles

and, hence, all other forms of matter

are formed,

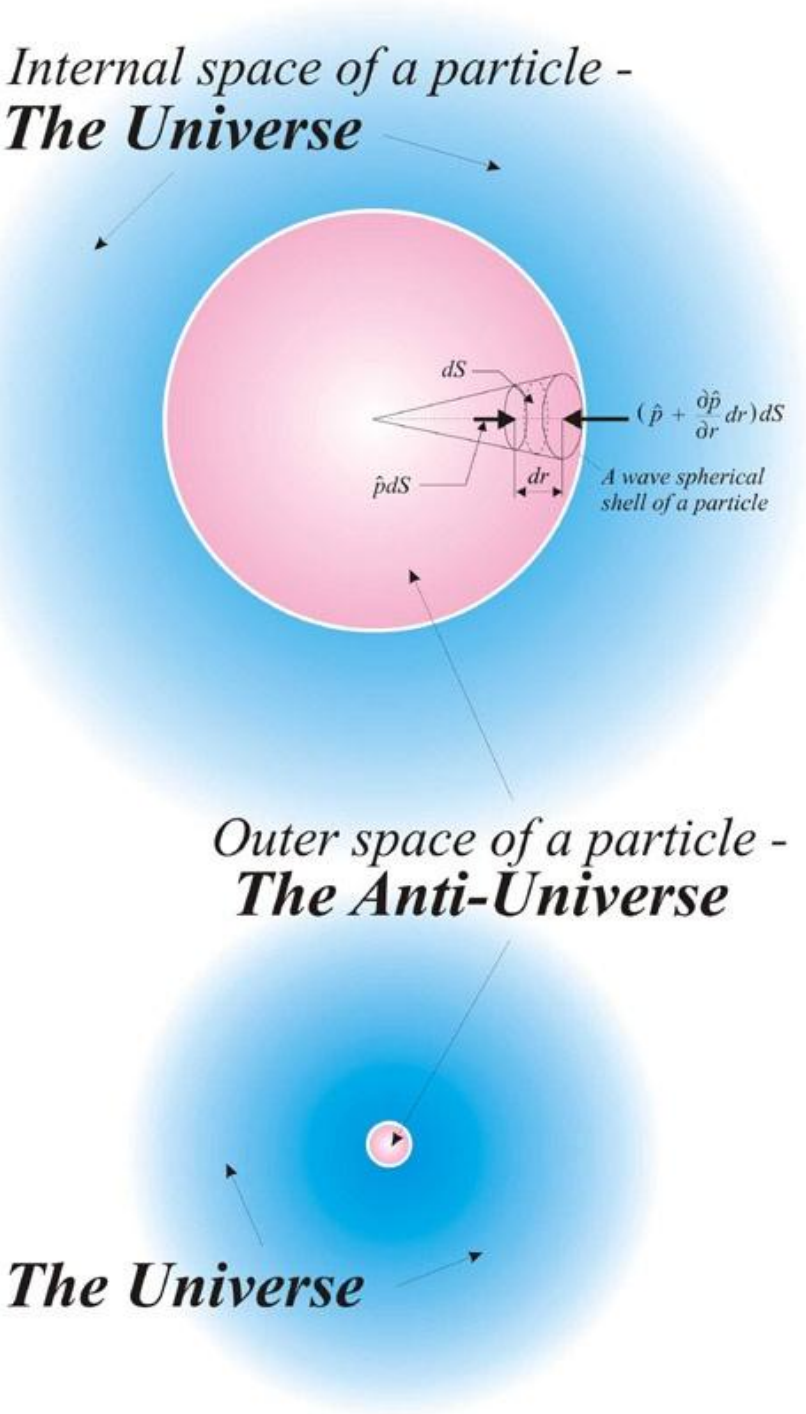
and which is a ***medium for*** *the* ***propagation*** *of* ***perturbations*** *in the form of electromagnetic and gravitational waves.*

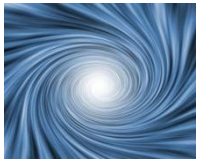
It can be called ***aether***, ***physical vacuum*** *or some other way. It is not essential; it does not alter the main concept of the WM on*

Material-Ideal Essence of the Universe,

in which all (besides the ideal part) is matter,
and an ***absolute vacuum*** *(emptiness)* ***does not exist***.

What is an elementary particle from the point of view of the DM?





<u>According to the DM</u>:

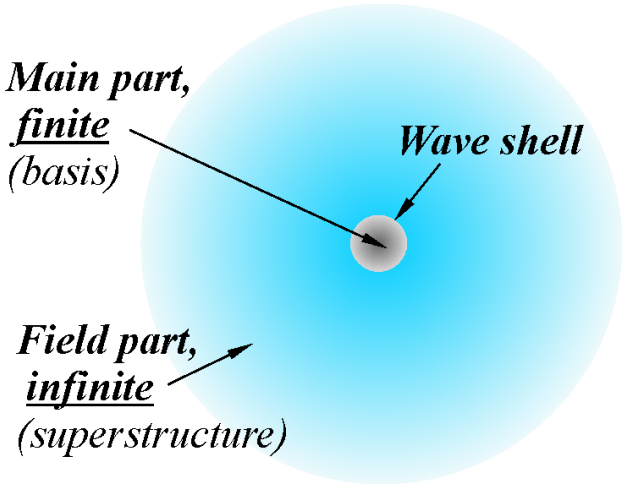
Elementary particles

are formed in result of ***compression*** *(thickening) of* ***local swirls*** *of the above-mentioned wave field-space of the Universe (primary* ***comprehensive, physical****).*

They behave like ***pulsating spherical microobjects****.*

Longitudinal oscillations

(pulsations) *of their* ***wave shells****, occurring at the* ***fundamental frequency*** ω_e *inherent in the* ***atomic*** *and* ***subatomic levels*** *(discovered in the DM),* ***provide interaction*** *of the particles in radial directions with each other and with the surrounding field-space.*



The wave shell

is an ***intermediate*** *(characteristic)* ***sphere****.*

It divides the ***main*** *part of the particle from its* ***field part****; the latter gradually merges with the surrounding field-space to infinity.*

The ***main part*** *(****finite****),*
within the characteristic sphere, is the ***basis*** *of the particle. We regard it as the* ***Anti-Universe****.*

The ***field part*** *(****infinite****)*
represents its ***superstructure*** *(the* ***Universe****).*

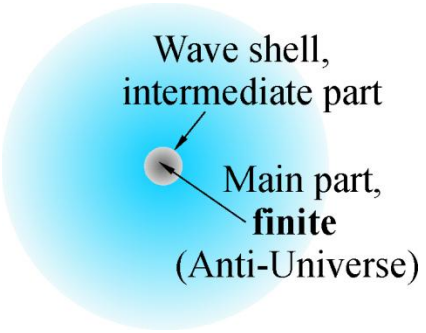
Thus, ***specific physical point of the wave field-space*** *(formed from this space itself), observed experimentally as a microobject (an* ***elementary particle****), in fact is the formation of*

Finite-Infinite in Size.

Characteristic features of the particles

regarded as

Finite-Infinite wave formations



Finite size

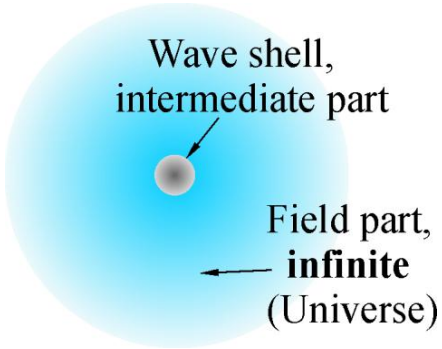
(the main part)

of a particle is restricted by the ***spherical wave shell*** *(intermediate) pulsating at the strictly defined* ***ultimately high fundamental frequency*** $\omega_e = 1.869162505 \times 10^{18}\ s^{-1}$ *inherent in the* ***atomic*** *and* ***subatomic levels***.

Pulsations perturb *the surrounding wave field-space. The perturbation, spreading, leads to the wave* ***exchange*** *(interaction) of particles, occurring within the distances of the order of the* ***fundamental wave radius,*** $\lambda\!\!\!^{-}_e = 1.60 \times 10^{-8}\ cm$ *, corresponding to the above frequency.*

Infinite size

(the field part)



Pulsations *of the wave shell (intermediate) of a particle at the* ***ultimately low fundamental frequency*** ω_g ($\omega_g = 9.158 \times 10^{-4}\ s^{-1}$), *discovered in the DM along with* ω_e, ***generate****, respectively,* ***long waves*** *in outer space. We call them* ***gravitational waves****, because they define the* ***gravitational exchange*** *(interaction) of particles at the* ***mega level.***

Infinite *size of particles* ***has no boundary****, but it includes a far remote zone restricted by the* ***gravitational wave spherical shell****. The size of the shell is defined by the* ***gravitational wave radius*** *of particles (* $\lambda\!\!\!^{-}_g = 327.36\,Mkm$ *). This shell divides oscillatory and wave domains of particles at the mega level.*

All information

about the structure of matter and the mystery of life is

hidden in the basis

of elementary particles and their compounds,
considering in the WM (as was mentioned above) as the

Anti-Universe

Accordingly,

All phenomena

that we observe in the ***Universe*** *are* ***external manifestations*** *of the processes occurring in the*

Anti-Universe

Thus, in accordance with the DM,

elementary particles behave like **pulsating spherical microformations**, being in the dynamic equilibrium with environment.

In order to **derive** the relevant **equations**

describing their behaviour,

the **decisive factor** is the correct definition of the **conditions** on the boundary of their pulsating wave spherical shells. We started with them.

How was this done and **what did it lead to**?

We present here the results obtained from consideration of only

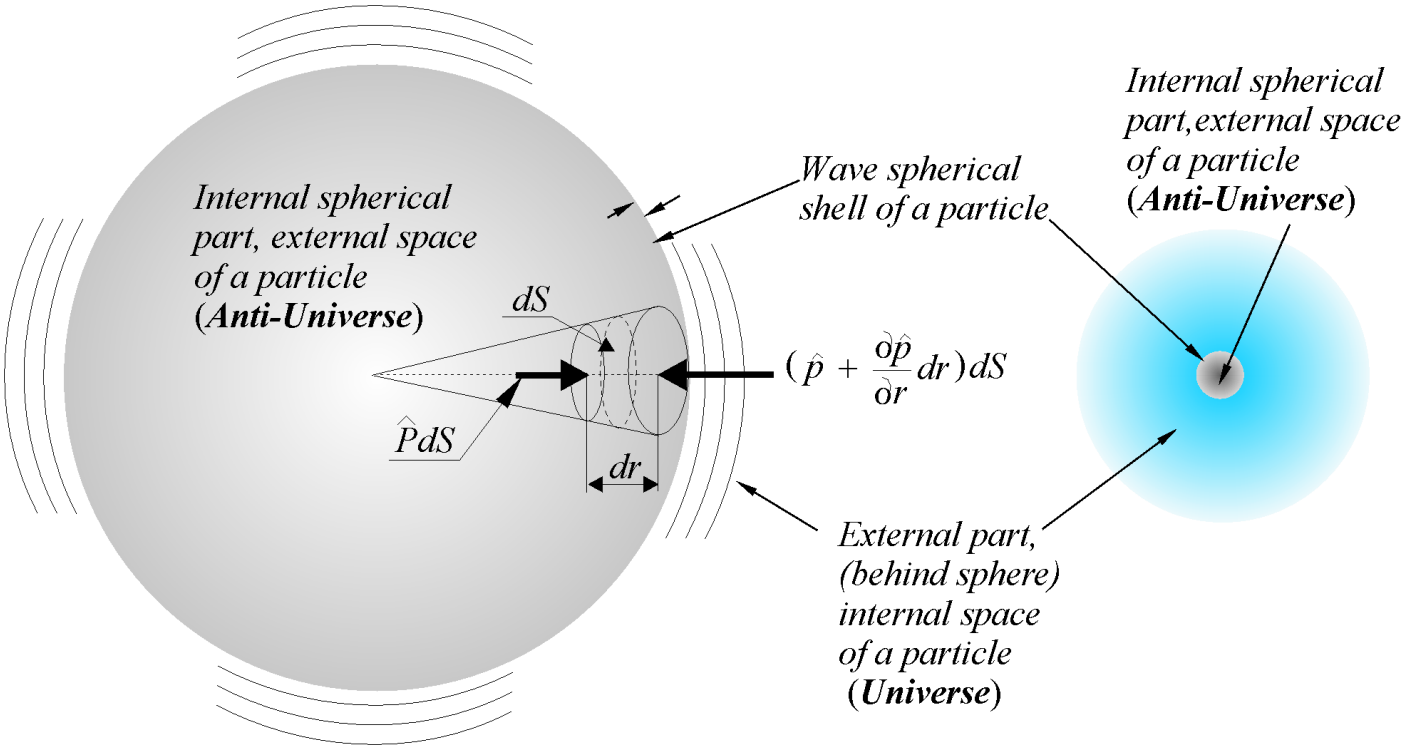
Central Exchange

This led us to the equations for:

1) ***Exchange of motion*** and
2) ***Exchange of mass.***

Because of pulsations, the **spherical volume** of a particle **periodically changes, increases** and **decreases**, at the strictly defined frequency. It means that at this frequency the **left** and **right** sides of the shell are undergone continuously to the **alternating pressure**.

At some point in time, the **conditions** on the shell are as shown below:



Initial conditions

$\hat{p}$ *is two-dimensional density of exchange, or pressure of the field of exchange;*

$\hat{p}dS$ *and* $(\hat{p} + \frac{\partial \hat{p}}{\partial r} dr)dS$ *are powers of exchange of the fields of matter-space (internal and external) with an element* dS *of the shell of a particle.*

Just these conditions allowed us to derive the corresponding equation describing the behaviour of a particle, if we consider it as the wave ***dynamic*** (***pulsating***) ***formation***.

Based on the above conditions !

*we have arrived at the **general equation** of central exchange*
*(**unknown earlier** in physics):*

Power of central exchange

with the environment

(on the boundary of a spherical shell of a particle with the area S and radius r)

$$\hat{F}_s = \frac{4\pi r^3 \varepsilon_0 \varepsilon_r}{1 + k^2 r^2}(1 - ikr)\hat{\upsilon} i\omega$$

$\varepsilon_0 = 1 g \cdot cm^{-3}$ is the ***absolute unit density***; ε_r is the ***relative density***.

$\hat{\upsilon} = \upsilon(kr)e^{i\omega t}$ is the ***speed of wave exchange*** (interaction)

$k = \frac{2\pi}{\lambda} = \frac{\omega}{c}$ is the ***wave number,*** corresponding to a strictly determined ***fundamental frequency*** ω of the field of exchange.

c is the ***basis speed of wave exchange***.

The general equation (★) of the central exchange

contains information about both:

the exchange of motion and exchange of mass.

Therefore, reflecting respectively the two types of exchange, (★) can be presented in two ways:

in the form of the equation of ***Exchange of motion,***

$$\frac{4\pi r^3 \varepsilon_0 \varepsilon_r}{1+k^2 r^2}\left(\frac{d\hat{\upsilon}}{dt}+kr\omega\hat{\upsilon}\right)=\hat{F}_s \qquad (1)$$

and in the form of the equation of ***Exchange of mass,***

$$\frac{4\pi r^3 \varepsilon_0 \varepsilon_r}{1+k^2 r^2}\omega(i+kr)\hat{\upsilon}=\hat{F}_s \qquad (2)$$

Consider the results following from these equations.

Part 2

Main Results

The origin of mass

As it follows from all the stated above, an

Elementary particle
is indissolubly associated
with the surrounding wave field-space
(which is an infinite part of the particle itself)

Being a specific pulsating formation of the space,

a particle acquires mass
from this very space.

Analysis of the solutions of Eqs. (1) and (2) shows that the

mass of elementary particles really has the associated (acquired) nature.

As follows from Eq. 1,

Mass
of an elementary particle

is defined by the formula

$$m = \frac{4\pi r^3 \varepsilon_0 \varepsilon_r}{1 + k^2 r^2} \qquad (3)$$

$k = \frac{\omega_e}{c} = \frac{1}{\lambda\!\!\!^{-}_e}$ *is the wave vector,* ω_e *is the* ***fundamental frequency*** *of atomic and subatomic levels,* $\omega_e = 1.869162505 \times 10^{18}\, s^{-1}$ *;* r ***varies with this frequency*** *by the amount* $\pm dr$ *;* $\varepsilon_0 = 1\, g \cdot cm^{-3}$ *is the absolute unit density, the relative density* $\varepsilon_r = 1$ *at the field level.*

Thus,

mass is associated, dynamic

The rest mass does not exist

Associated mass *is analogous to the* ***hydrodynamic*** *(added)* ***mass*** *attributed to a body moving in liquid*

For example, a hollow ***pulsating*** elastic sphere or cylinder in water sets in motion all surrounding water mass, which is called thereby ***hydrodynamic***.

(*Equations to calculate the added mass are based on traditional ship design techniques*)

I will remind once again.

In view of the DM, a particle is generated from the wave field-space, and is a specific physical point of this space, i.e., its modified compacted (thickened) formation.

A size of the proton

is defined in ***physics*** *by the so-called* ***rms radius of its charge:***

$$r_p = 0.8751\times10^{-13}\ cm \qquad (4)$$

In the DM *the proton size is defined by the* ***radius*** r_p *of its* ***wave shell.***

Assuming that $r = r_0 = 0.52917721067\times10^{-8} cm$ *(Bohr's radius) and* $\varepsilon_r = 1$ *, we have*

$$m_{nucleon} = \frac{4\pi r_0^3 \varepsilon_0}{1+k^2 r_0^2} = 1.679336988\cdot10^{-24} g \qquad (5)$$

Obtained ***mass*** *differs by only tenths of a percent from the mass of the* ***proton*** *and* ***neutron****:*

$$m_p = 1.672621777\times10^{-24}\ g \qquad m_n = 1.674927351\times10^{-24}\ g \qquad (6)$$

The ***radius*** r_p *of the* ***wave proton sphere,*** *corresponding to the* ***proton mass*** m_p (6)*, has the value*:

$$r_p = 0.528421703\times10^{-8} cm \qquad (7)$$

This is the true radius of the proton!

Hence, ***the hydrogen atom does not have a nucleus (****of the order* $10^{-13}\ cm$ ***), just like the rest of the atoms, consisting of protons and neutrons, also do not have nuclei. H and*** H^+ ***(proton) are almost equal in size and, therefore, practically do not differ from each other!***

Atoms do not have nuclei !

Confirmed experimentally: http://shpenkov.com/pdf/talk2016Paris.pdf

A size of the electron

is defined in ***physics*** *by the so-called* ***classical electron radius****:*

$$r_e = \left(\frac{\upsilon_0}{c}\right)^2 r_0 = 2.8179403267\times10^{-13} cm \qquad (8)$$

It is approximated in physics as a ***point particle****.*

In the DM *the electron's* ***size*** r_e *is defined by the radius of its characteristic sphere (****wave shell****), also from Eq. (3), which in this case takes the form*

$$m_e = \frac{4\pi r_e^3 \varepsilon_0}{1+k^2 r_e^2} \qquad (9)$$

In this formula $k^2 r_e^2 << 1$ *. Neglecting it, the* ***radius of the electron sphere*** *can be determined by the following simplified formula:*

$$r_e = \sqrt[3]{m_e / 4\pi\varepsilon_0} \qquad (10)$$

In result we have

$$r_e = 0.417052597\times10^{-9}\ cm \qquad (11)$$

This is the true radius of the electron!

The nature of charges

The charge formula, which follows from Eq. 2, has the form

$$q = \frac{4\pi r^3 \varepsilon_0 \varepsilon_r}{1 + k^2 r^2}\omega = m\omega \qquad (12)$$

(ω is the fundamental frequency: ω_e or ω_g)

The charge is of an exchange nature and is the measure of the rate of mass exchange (dimension $g \cdot s^{-1}$).
We call q the exchange charge, or the power of mass exchange

Electron charge

is an elementary exchange charge, or an elementary quantum of the rate of mass exchange

$$e = m_e\omega_e = e_{CGSE}\sqrt{4\pi\varepsilon_0} = 1.702691627\times10^{-9}\ g\cdot s^{-1} \qquad (13)$$

$$e_{CGSE} = 4.803204401\times10^{-10}\ g^{1/2}cm^{3/2}s^{-1} \qquad e_{SI} = 1.602176462\times10^{-19}\ C$$

$\varepsilon_0 = 1\, g\cdot cm^{-3}$ *is the* ***absolute unite density,*** ε_r *is the* ***relative density***

Following from Eq. (13),

Fundamental frequency,

$$\omega_e = \frac{e}{m_e} = 1.869162505 \times 10^{18}\ s^{-1} \qquad (14)$$

is the ***basic frequency*** *of the* ***atomic*** *and* ***subatomic levels*** *of the Universe, on which the* ***exchange*** *(interaction) is realized; it determines the* ***average discreteness of the space*** *at the levels;* $m_e = 9.10938291 \times 10^{-28}\ g$ *is the associated electron mass.*

Fundamental wave radius

of the field of exchange, corresponding to the frequency ω_e*, is*

$$\lambda\!\!\!^{-}_e = \frac{\lambda_e}{2\pi} = \frac{c}{\omega_e} = 1.603886998 \times 10^{-8}\ cm \qquad (15)$$

The frequency ω_e

defines all processes at the atomic and subatomic levels,

*including the **strength** and **length** of **intra- and interatomic bindings** (strong and electromagnetic), i.e., **defines the structure of substances**: atoms, molecules, liquids, and solids.*

The wave radius $\lambda\!\!\!^{-}_e$

*shows itself as a measure for setting the pitch, providing the **strictly certain distance** in **disposition of atoms** in all chemical compounds. For example:*

A doubled value of $\lambda\!\!\!^{-}_e$ **:** $D = 2\lambda\!\!\!^{-}_e \approx 0.32\,nm$ ***correlates with** an average value of **lattice parameters** in crystals.*

From the DM it also follows

Universal Law of Exchange

$$\langle F \rangle = \omega_{fund}^2 \frac{m_1 m_2}{4\pi\varepsilon_0 r^2} \quad * \qquad (16)$$

(* - Averaged value, for the inphase and antiphase ($\Delta\varphi$ = o; π) cases, modulo)

m_1 *and* m_2 *are* ***associated masses*** *of the objects,*

$\varepsilon_0 = 1 g \cdot cm^{-3}$ *is the* ***absolute unit density***,

ω_{fund} *is one of the two* ***fundamental frequencies*** (ω_e *or* ω_g)

ω_g *is the* ***fundamental frequency of gravitational field***

For $\Delta\varphi$ = o: $$\langle F \rangle = -\omega_{fund}^2 \frac{m_1 m_2}{4\pi\varepsilon_0 r^2} \qquad (17)$$

Coulomb's *and* Newton's laws

are ***particular cases*** *of*

the Universal Law of Exchange (16).

They have, respectively, the following form:

(18) $$\left\langle F_e \right\rangle = \omega_e^2 \frac{(zm_e)(Zm_e)}{4\pi\varepsilon_0 r^2}$$ *and* $$\left\langle F_g \right\rangle = \omega_g^2 \frac{(zm_n)(Zm_n)}{4\pi\varepsilon_0 r^2}$$ (19)

Eq. (18) describes the ***exchange interaction*** *at the level of the wave* ***"electric" field*** *of elementary quanta of exchange, having the* ***associated mass*** m_e *and the* ***exchange*** *("**electric**")* ***charge***

$$q_e = e = m_e\omega_e$$

Eq. (19) describes the ***exchange interaction*** *at the level of the wave* ***gravitational field*** *of gravitons-nucleons having the associated mass* m_n *and the* ***exchange*** *(**gravitational**)* ***charge***

$$q_{ng} = m_n\omega_g$$

Fundamental gravitational frequency

of particles

$$\omega_g = \sqrt{4\pi\varepsilon_0 G} = 9.158\times10^{-4}\ s^{-1} \qquad (20)$$

follows from the Universal Law of exchange $\langle F\rangle = \omega_f^2 \frac{m_1 m_2}{4\pi\varepsilon_0 r^2}$ *when comparing it with Newton's law of gravitation* $F = G\frac{m_1 m_2}{r^2}$. *It is a* ***proper frequency*** *of the* ***mega level*** *of the Universe, responsible for the* ***gravitational exchange*** *(interaction) of objects;* $G = 6.67408\times10^{-11}\ m^3 kg^{-1}s^{-2}$ *is the Newtonian constant of gravitation (empirical);* $\varepsilon_0 = 1\ g\cdot cm^{-3}$

Gravitation, like everything in the Universe, is of a wave nature!

Gravitational wave radius

(*the radial elementary gravitational wave*)

of elementary particles, corresponding to the frequency ω_g***, is***

$$\lambda\!\!\!^{-}_g = \frac{\lambda_g}{2\pi} = \frac{c}{\omega_g} = 3.2736\times10^{13}\ cm = 327.36\ Mkm \qquad (21)$$

The nature of gravitation:

Definition

(*In accordance with the WM*)

Gravitational interaction of bodies is the result of wave exchanges of all elementary particles that make up the bodies at the fundamental frequency of the gravitational wave field

$$\omega_g = 9.158 \times 10^{-4}\ s^{-1}$$

Gravitational radius $\lambda\!\!\!^{-}_{g} = \dfrac{c}{\omega_g}$

determines the radii of the wave spherical shells of the particles at the mega (gravitational) level:

$$r = \lambda\!\!\!^{-}_{g} z_{m,n} = 327.36 \times z_{m,n} \ \ Mkm \qquad (22)$$

and the ratio between the radii of the shells:

$$r_s = r_1 \frac{z_{m,s}}{z_{m,1}} \qquad (23)$$

Eqs. (22) and (23) give us the ***gravitational spectrum*** *of* ***H-atomic wave spherical shells****, which in the first approximation are* ***close to the elliptical orbits*** *(having relatively small eccentricities) of the* ***planets*** *and* ***their satellites.*** $z_{m,n}$ *are roots of Bessel functions.*

For example, at $z_{m,n} = j_{0,1} = 2.4048$ *(Eq. 22),* $r = 787.3\ Mkm$ *, that is close to the semi-major axis of an elliptical orbit of* ***Jupiter*** *(*$r_{Ju} = 778.57\ Mkm$ *). For* ***Uranus*** *(*$r_{Ur} = 2876.68\ Mkm$*),* $z_{m,n} = j_{0,3} = 8.6537$ *, we have* $r = 2833.2\ Mkm$ *. Etc.*

Gravitational frequency ω_g *defines*

Radial time wave-period, T_g

$$T_g = 2\pi / \omega_g = 0.686087 \times 10^4 \ s \qquad (24)$$

and

Azimuthal time wave, T_c

of the fundamental tone,

$$T_c = 4\pi T_g = 8.62162 \times 10^4 \ s \qquad (25)$$

The value of T_c *practically coincides with the average length of a* ***solar day*** *on Earth:*

$$24\ h = 8.640 \times 10^4 \ s$$

The azimuthal time wave T_c *repeats the structure of the* ***spatial wave of the fundamental tone in Bohr's first orbit****,* $\lambda_0 = 4\pi r_0$ *, and, analogously, the* ***azimuthal (transversal) electron wave of the fundamental tone****,* $\lambda_e = 4\pi r_e$*, where* r_e *is the radius of the electron wave shell.*

The relationship (25) shows that our

Earth is in a harmonic resonance bond

*with the **fundamental (gravitational) frequency*** ω_g.

*Just like an **electron** in the first Bohr orbit is in **harmonic resonance** with the **fundamental frequency** of the **subatomic** and **atomic levels*** ω_e.

*This means that the **Earth** is **fundamentally different** from other planets (just like the **hydrogen atom differs** from all other elements of the Periodic Table), **taking a special place** in the field-space of the Solar system and maybe in Cosmos on the whole*!

From the DM it follows that

Gravitational Constant G

is defined by the fundamental frequency ω_g **:** $G = \omega_g^2 / 4\pi\varepsilon_0$ *(Eq. 20).*

Taking into account (24) and (25), $\omega_g = 8\pi^2 / T_c$ *, the constant G can also be presented as follows:*

$$G = \frac{16\pi^3}{T_c^2 \varepsilon_0} \qquad (26)$$

Thus,

Indissoluble harmonic bond

*of **micro** and **mega** objects of the Universe*
in a single complex of
infinitely small** and **infinitely large

*is confirmed by the **discovery** of the characteristic fundamental parameters of particles (constituents of the objects), concerning their behaviour at the different levels of the Universe: **atomic**, **subatomic,** and **mega (gravitational**).*

***These are** the discoveries of the **fundamental frequencies,** ω_e and ω_g , and the fundamental **wave radii ,** $\lambda\!\!\!^{-}_{e}$ and $\lambda\!\!\!^{-}_{g}$.*

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*The **fundamental frequencies** (ω_e and ω_g) are the main parameters, entering in the **Universal Law of Exchange** (also the **discovery** of the DM, Eq. 16), to which the objects of both of the above levels are subject to:*

$$\langle F \rangle = \omega^2_{fund} \frac{m_1 m_2}{4\pi\varepsilon_0 r^2} \qquad (27)$$

(*Here, as everywhere in the WM,* $\varepsilon_0 = 1\, g \cdot cm^{-3}$)

Neutron

is one of the main particles of atomic systems, the ***fundamental quantum of mass*** *and the* ***fundamental graviton.***

The exchange gravitational charge of the neutron

$$q_{ng} = m_n \omega_g = 1{,}53389 \times 10^{-27}\ g \cdot s^{-1} \qquad (28)$$

$$m_n = 1.674927351 \times 10^{-24}\ g = 1838.6836605\, m_e \qquad \omega_g = 9.158 \times 10^{-4}\ s^{-1}$$

The radius *of the wave shell of nucleons (proton and neutron) has the order* $0.528... \times 10^{-8}\ cm$ *. As follows from the solutions of the wave equation* $\Delta\hat{\Psi} - \frac{1}{c^2}\frac{\partial^2\hat{\Psi}}{\partial t^2} = 0$ *the* ***center of mass*** *of a nucleon performs* ***radial oscillations*** *at the fundamental frequency* $\omega_e = 1.869162559 \times 10^{18}\ s^{-1}$ *with* ***amplitude*** *of the order*

$$1.4 \times 10^{-13}\ cm$$

Oscillations with this amplitude cover the ***dynamic spherical volume*** *in the center of a nucleon. The spherical space, limited by this volume,* ***impacts the character of scattering*** *of particles and waves.*

Just this space, unfortunately, was ***mistakenly taken*** *by Rutherford* ***for the superdense nucleus in the center of an atom*** [4, 5].

Electron exchange charge

$$e = m_e \omega_e \qquad (29)$$

is responsible for the strength of ***electromagnetic interactions****, in particular, for* ***interatomic bonds*** *in molecules and crystals*.

Actually, the electron binding energy ***at the bond length*** *equal to the fundamental wave radius* $\lambda\!\!\!^{-}_e = 1.6 \cdot 10^{-8}\ cm$ *, is*

$$E_e = \frac{e^2}{8\pi\varepsilon_0 \lambda\!\!\!^{-}_e} \approx 4.49\ eV \qquad (30)$$

This value practically coincides with the ***dissociation energy*** *of the molecules, e. g.,* H_2 *(4.48 eV). Accordingly, the characteristic break energy of chemical bonds* ***per mole*** *of substance (****dissociation energy****) is*

$$E_{mol} = E_e N_A = 103.4492\ kcal \cdot mol^{-1}$$

For CH_4 *and* C_2H_4*,* ***experimental*** *values of* E_{mol} *are* 101 *and* $104\ kcal \cdot mol^{-1}$ *, respectively. The* ***electron work functions*** *of mono- and polycrystals of* Al, B, Bi, W, Fe, Co, *and* Cu *are also about* 4.49 *eV*: $4.25 \div 4.67\ eV$ [6].

Exchange charges
of nucleons (neutrons and protons)

$$q_n = m_n \omega_e \quad \textit{and} \quad q_p = m_p \omega_e \qquad (31)$$

are responsible for the strength of ***strong*** *(“****nuclear****”)** ***interactions.***

The ***internodal binding energy*** *of neutrons at the bond length typical for the* ***shell-nodal structure*** *of the atom,* $r = 1.4332 \cdot 10^{-8}\ cm$ *, is equal to*

$$E_{n-n} = \frac{q_n^2}{8\pi\varepsilon_0 r} = 16.965\ MeV \qquad (32)$$

This value of the binding energy is characteristic for ***strong*** *(“****nuclear****”)** ***interactions****.*

It correlates, e.g., with the threshold energy of (γ, n) *reactions in the “nucleus”:* $16.3 \pm 0.4\ MeV$ *; etc.*

****As follows from the DM and Shell-Nodal atomic model*** **[1, 5]**, ***all of the atoms (except for neutrons, protons, and protium) are elementary nucleon molecules, and they do not have nuclei !***

Energy
of fundamental interactions

is defined by the exchange charges squared (30, 32).

If the energy (strength) of ***electromagnetic*** *interactions (atomic level) is* ***taken as 1, then in this scale,*** *the energy of* ***strong*** *interactions (subatomic level) has the order of*

$$q_n^2 / q_e^2 = 3.4 \times 10^6 \qquad (33)$$

and ***gravitation*** *interaction (mega level),*

$$q_{ug}^2 / q_e^2 = 0.8 \times 10^{-36} \qquad (34)$$

Hence, the ***strengths*** *of three* ***fundamental interactions: strong, electromagnetic,*** *and* ***gravitational, relate approximately*** *as*

$$10^6 : 1 : 10^{-36} \qquad (35)$$

overlapping the range of 42 decimal orders in magnitude.

$$q_{ug} = m_u \omega_g \approx 1.52 \times 10^{-27}\ g \times s^{-1} \qquad (36)$$

$m_u = 1.66053904 \times 10^{-24}\ g$ ***is the unified atomic mass unit.***

Thus, an elementary particle

(*according to the DM*)

being an interference microformation of the wave field-space, a local pulsating three-dimensional vortex in the field-space,

looks like a spherical

Micro pulsar

A series of the discoveries

(we made within DM) of unknown earlier fundamental parameters, defining basic properties and behavior of the particles, **confirms**

Validity of the DM

as a theory describing the structure of elementary particles more adequately reality than the SM

At the end, in order to confirm the above conclusion once again,

I present yet another solution (which also became possible only thanks to the DM) to the next great problem of modern physics:

As you know

The great mystery

of physics so far:

Why the speed of light squared (c^2) defines the internal energy E_0 of the quiescent particles

$$E_0 = m_0 c^2 \; ?$$

*(Thus, a particle is **motionless**, $\vec{V}_{particle} = 0$; and m_0 , as believe, is the **rest mass**)*

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*The reason for the **inability** of modern physics to **answer this question**, **in principle**, is that the structure of the particles is described within the **SM**. The latter is the **inadequate** theory, as based on numerous fictional postulates.*

*Consequently, it **does not know anything** about the nature of the **mass** and the physical meaning of the **speed** c in the equation.*

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*Thanks to the DM, the origin of mass m_0 , the nature of c parameter and, hence, the true meaning of the energy E_0 became **clear**:*

According to the DM

Equation $E_0 = m_0 c^2$ * *defines the*

Internal dynamic energy (E_0)

of ***pulsating particles,*** *where,*

1) m_0 *is the* ***associated mass*** *of a particle*
(the wave pulsating formations do not have the ***rest mass*** *in principle),*

2) c is the ***basis speed of waves generated*** *by the* ***pulsating wave shell*** *of a particle in the ambient field-space.*

The ***wave exchange*** *(interaction) of a particle with a surrounding field and other particles, both at rest and motion, is realized with the* ***speed*** *c at the* ***fundamental frequencies*** *of the pulsations* (ω_e *and* ω_g).

The constant *c is one of the* ***fundamental parameters*** *of particles along with the* ***associated mass*** m_0 *and the* ***exchange charge*** *q.* !

*Thus, revealing for the first time the true physical meaning of the most famous equation in physics * (on the basis of the discovery of the origin of mass and the nature of the speed of light c),*

the DM concept on the ***wave nature*** *of origin and the* ***behavior*** *of the particles* ***passed*** *the next clear* ***test*** *for suitability.* !

Conclusion

*Thanks to the **Dynamic Model,** an **impressive series** of the **fundamental discoveries** of unknown earlier **fundamental parameters** and **properties** of the particles, defining their **behavior**, was made* [7].

(*They were marked with contour lines in this report*)

These discoveries,

*together with other **discoveries of the Wave Model**, are listed in the*

Memorandum

***"On scientific studies**... (of the author) ... **approved by Congress XV Russian Physical Society, Moscow, April 16, 2016"**:*

[JRFHO, Vol. 88, № 2, pages 10-12 (in Russian), 136-137 (in English) (2016)]

http://www.rusphysics.ru/magazine/1052/
http://shpenkov.com/pdf/JRFHO-88-2.pdf

Judging by all the results,

(http://shpenkov.com/pdf/JRFHO-88-2.pdf)

The WM
has shown itself
as a well-proven real
alternative to the SM

(the only alternative that appeared, finally, in physics and, that is very important, based on the adequate conceptual basis)

Breakthrough in physics became a fait accompli!

Thank you very much for your attention!

http://shpenkov.com/pdf/talkBrussels2017.pdf

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